

Unit 15
Day 3
Factor Theorem

Factor theorem:

The polynomial $x-k$ is a factor of the polynomial $P(x)$
iff $P(k)=0$.

Is $(x-1)$ a factor of the polynomial?

1) $P(x)=x^3-2x^2-x+2$ $k=1$

$$\begin{aligned} P(1) &= 1^3 - 2(1)^2 - 1 + 2 \\ &= 1 - 2 - 1 + 2 \\ &= 0 \end{aligned}$$

yes

Find the polynomial of lowest degree with following roots (zeros, solutions).

1) 3, -2

$$(x-3)(x+2)$$

$$x^2 - x - 6$$

2) $3+\sqrt{2}$, $3-\sqrt{2}$; $f(2)$

$$(x-3-\sqrt{2})(x-3+\sqrt{2})(x-2)$$

$$(x^2-3x+\sqrt{2}-3x+9-3\sqrt{2}-x\sqrt{2}+3\sqrt{2}-2)(x-2)$$

$$(x^2-6x+7)(x-2)$$

$$x^3-6x^2+7x-2x^2+12x-14 = x^3-8x^2+19x-14$$

Conjugate zero theorem:

If $P(x)$ is a polynomial having only real coefficients and if $z=a+bi$ is a zero of $f(x)$, where a and b are real numbers, $\bar{z}=a-bi$ is also a zero of $f(x)$.

1) 2, $1+3i$, $1-3i$

$$(x-2)(x-1-3i)(x-1+3i)$$

$$x-2(x^2-x+3i-x-3i)$$

$$x-2(x^2-2x+10)$$

$$x^3-2x^2+10x-2x^2+4x-20$$

$$x^3-4x^2+14x-20$$

Polynomial
2) -3, 1, and 4; $f(2)=30$

$$30 = a(x+3)(x-1)(x-4)$$

$$30 = a(2+3)(2-1)(2-4)$$

HW pg 300 36-50 even